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| APPLICATION NO.         | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-------------------------|-------------|----------------------|---------------------|------------------|
| 10/663,531              | 09/16/2003  | Harry L. Tuller      | MIT9983             | 3582             |
| 55740                   | 7590        | 12/30/2005           | EXAMINER            |                  |
| GAUTHIER & CONNORS, LLP |             |                      | RICHARDS, N DREW    |                  |
| 225 FRANKLIN STREET     |             |                      | ART UNIT            |                  |
| BOSTON, MA 02110        |             |                      | PAPER NUMBER        |                  |
|                         |             |                      | 2815                |                  |

DATE MAILED: 12/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                                      |                                      |  |
|------------------------------|--------------------------------------|--------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/663,531 | <b>Applicant(s)</b><br>TULLER ET AL. |  |
|                              | <b>Examiner</b><br>N. Drew Richards  | <b>Art Unit</b><br>2815              |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 November 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-13 and 15-20 is/are pending in the application.
- 4a) Of the above claim(s) 1-10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 11-13 and 15-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/14/05 has been entered.

### ***Election/Restrictions***

2. Applicant's election without traverse of Group II, claims 11-20, in the reply filed on 10/27/04 is acknowledged.

### ***Product-by-Process Limitations***

3. While not objectionable, the Office reminds Applicant that "product by process" limitations in claims drawn to structure are directed to the product, per se, no matter how actually made. *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also, *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wethheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al.*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of

Art Unit: 2815

the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or otherwise. Note that applicant has the burden of proof in such cases, as the above case law makes clear. Thus, no patentable weight will be given to those process steps which do not add structural limitations to the final product.

### ***Claim Objections***

4. Claim 19 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Since claim 16 has been amended to recite the substrate, n-type ZnO layer and p-type ZnO layer, claim 19 adds no further limitations and therefore does not further limit claim 16.

### ***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 19 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 19 recites "said acceptor-doped material" in lines 1-2, there is a lack of antecedent basis for this limitation. Further claim 19 recites "a n-type ZnO layer", "a

Art Unit: 2815

substrate", and "a p-type layer". It is unclear as to whether these are the same layers previously recited in claim 16 or whether additional layers are being claimed. For the sake of the art rejection below it is assumed that claim 19 is reciting the same layers as claim 16 and not further layers.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –  
(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 11-13 and 15-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Sano et al. (U.S. Patent No. 6,664,565 B1).

With regard to claim 11, Sano et al. disclose in figures 1-8 and on columns 1-10, for example, a wide band gap semiconductor device. Sano et al. disclose a device in figure 6 comprising:

- a substrate 301;
- a n-type ZnO layer 311 formed on the substrate; and
- a p-type ZnO layer 315 formed on the n-type ZnO layer.

Though Sano et al. do not explicitly state that the impurities are activated, it is nonetheless implicitly understood that the impurities are activated as the device of Sano

Art Unit: 2815

et al. operates by using the function of the p-type and n-type dopants in the materials.

With regard to the limitation of the layers being annealed in air. This limitation is a product-by-process limitation that does not necessarily structurally distinguish over the prior art. Thus, the structure of Sano et al. anticipates this claim.

With regard to claim 16, this claim is rejected similar to claim 11 above, but Sano et al. further disclose their device comprising a p-n junction.

With regards to claims 12, 13, 15, 17, 18 and 20, the limitations dealing with the reducing conditions and the intermediate temperatures are merely further defining the process portions of the product-by-process limitations of claims 11 and 16. These limitations are not considered to necessitate any further structure or to necessarily distinguish the structure claimed over the prior art. Sano et al. disclose the same final structure and thus anticipate the structure as claimed.

With regard to claim 19, the acceptor-doped material comprises a substrate 301/305, a n-type ZnO layer 311 deposited on the substrate, and a p-type layer 315 deposited on the n-type ZnO layer (figure 6).

### ***Response to Arguments***

9. Applicant's arguments received 5/2/05 have been fully considered but they are not persuasive.

Applicant has argued that Sano et al. does not describe annealing the ZnO layers to activate the p-type conductivity. This is not persuasive. Even though Sano et al. does not explicitly teach an activating step, it is inherent that the p-type conductivity

Art Unit: 2815

dopants are activated. If the dopants were not activated the p-type layer would not function as a p-type layer. For the layer to function as a p-type layer the dopants must necessarily be activated. Since the device of Sano et al. operates the dopants are "activated."

Applicant has also argued that Sano et al. teach the n-type layer being formed on a buffer layer and not on a substrate. This is not persuasive as the term "on" does not necessitate that the n-type layer be formed "directly on" or "contacting" the substrate. Using the term "on" does not preclude other layers being formed in between the substrate and the n-type layer. If applicant desires the term "on" to be so narrowly interpreted the claims can be amended to recite "directly on" or "contacting."

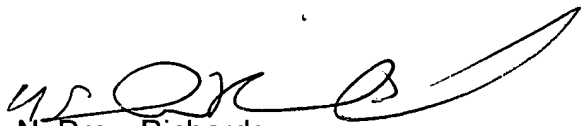
### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2815

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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AU 2815